PATENT SPECIFICATION (11) 1290781

DRAWINGS ATTACHED

1290781

(21) Application No. 832/70 (22) Filed 7 Jan. 1970

(31) Convention Application No. G 69 00 951

(32) Filed 11 Jan. 1969

(31) Convention Application No. G 69 07 931

(32) Filed 28 Feb. 1969

(31) Convention Application No. P 19 59 574.5

(32) Filed 27 Nov. 1969 in

(33) Germany (DT)

(45) Complete Specification published 27 Sept. 1972

(51) International Classification D02G 3/02 3/06//3/04 3/18
D03D 1/00 15/00 D06C 7/00 15/00

(52) Index at acceptance

D1W 1 7A 7C

D1K 216 223 310 421 430 456 474 542 54X 557 558
55Y 571 576 57Y 584 58X 62Y 654 65Y 67Y
687 688 68Y 690 703 70Y 719 724 727 768 76Y
791 79X

D1S 10

(54) IMPROVEMENTS IN PAPER-MAKING MACHINES

(71) We, BERKENHOFF & DREBES AKTIENGESELLSCHAFT, a German Body Corporate, of D-6334 Asslar, Kreis Wetzlar, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a paper-making machine comprising a sieve or screen made from plastics-coated thread.

Plastics threads are employed for many purposes, primarily in instances in which tear strength and corrosion resistance are required in special degree. They are frequently employed as a substitute for corrosion-proof wires in the production of endless sieves or screens for paper-making machines. Plastics threads may be made in the form of monofilaments, i.e. the thread as a whole consists of a single thick filament. The relatively great stiffness of such monofilaments represents an advantage as well as a disadvantage. The rigidity is usually favourable for example for weaving but the rigidity prevailing at the required tensile strength may be too great if the monofilament is to be employed for sewing.

Multifilament plastics threads consist of a great number of very thin individual fibres. For example, a thread of 0.4 mm diameter may consist of 200 individual filaments and may have a weight of 1.1 kgs. per 10,000 m length (1,100 dtex thread). A multifilament thread of this kind has a very low degree of flexing rigidity. The advantage of multifilament threads consists in their high load-carrying capacity, which is substantially greater than for a monofilament thread of the same cross-section. The low degree of rigidity is disadvantageous for weaving. The great liability of multifilament threads to wear by friction, is also disadvantageous. This sensitivity or weakness is explained by the fact that the very thin individual fibres are rubbed through easily, so that the thread finally tears. The threads, which possess satisfactory chemical stability, frequently have little resistance to wear by friction, whereas threads having satisfactory strength values are often insufficiently impervious to hydrolysis.

It has already been proposed to eliminate the shortcomings of multifilament threads by coating them with an acrylic resin, a dipping or immersion process being employed to apply the acrylic resin coating. The protective action of a coating of this nature, against mechanical stresses and rubbing in particular, is inadequate for many purposes however, since the dipping process does not provide adequately homogenous coatings. The dipping process also imposes the need to employ a solvent for the plastics, which must in due course be vaporised resulting in porous coatings. The known coatings for sieving fabrics exposed to high mechanical stresses, are particularly inadequate. Sieving fabrics are stressed by rubbing on guide rollers over which the fabric runs, as well as by friction between the threads, and by the rubbing action of the material to be processed on the sieve. An

impact stress may also be exerted on sieving fabrics by falling objects. Fabrics used as screens for paper-making machines may have a width of up to 12 m, and may run at speeds of up to 1,000 m/min.

According to the invention there is provided a paper-making machine comprising a sieve or screen made by the method which includes the steps of producing non-porous warp and weft threads by coating core threads with a molten thermo-plastic material, and so weaving the warp and weft threads as to leave interstices between them. The threads may be woven in a manner such that the weft threads alternately cross over and under weft threads.

A sieve or screen produced by the method according to the invention is particularly resistant to hydrolysis and to mechanical stresses and the weaving thereof is facilitated by the flexible character of the threads.

Threads of the kind used in the method are completely non-porous, because the thermo-plastic synthetic material does not contain any admixed ingredients which vaporise out out of the synthetic material during the curing of the same. It is thus possible to produce better coatings by means of thermoplastic synthetic materials, than by the previously known processes referred to above.

An advantage of the threads is that the coating may be produced from a pigmented plastics material. The threads of the sieve or screen may be welded to each other at the points of intersection by fusing the plastics coatings to each other, thereby establishing a satisfactory integrity of the sieve or screen. Further, the threads may be pressed flat at their points of intersection, at least. The mesh width may be varied by more or less extensive pressing flat of the threads, so that the permeability of the sieve or screen may thus be determined in simple manner.

In order that the invention may be clearly understood an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which: —

Fig. 1 is a cross-section to an enlarged scale, through a thread used in a sieve or screen according to the invention,

Fig. 2 is a view of a part of the thread, to an enlarged scale, with the coating partially removed, and

Fig. 3 illustrates, to an enlarged scale, a part of a sieve or screen made in accordance with the invention.

Referring to the drawings, a thread has an internal multifilament core 1 and a dense outer coating 2, Fig. 1. If desired, however, the core 1 may be a monofilament.

When the core is a multifilament core the filaments may consist of untreated or treated, for example provided with a thin coating, synthetic fibres, e.g. polyester fibres, or of artificial fibres or natural fibres, or inorganic fibres, e.g. glass fibre, or of a mixture of such fibres. A monofilament employed as a core consists of synthetic material. The term "synthetic fibres" is deemed to mean fully synthetic materials, e.g. polyester or acrylic resin. The term "artificial fibres" is deemed to mean fibres which are produced from natural organic substances, e.g. wood, but in which the natural substance has been extensively converted. Rayon is an example of an artificial fibre produced from wood. The term "natural fibres" is deemed to mean, for example, hemp or silk fibres. Glass fibres are an example of "inorganic fibres".

The thread thickness is preferably so dimensioned that the weight of the core thread in multifilament form lies within the range from 0.1 to 2.5 kgs/10,000 m (100 to 2,500 dtex), and the thickness of the coating layer amounts to 0.03 to 0.3 mm. In one embodiment a thread has a multifilament core having a weight of 1.1 kg/10,000 m (1,100 dtex) and a coating thickness of 0.1 mm.

If desired the multifilament core may consist of fibres which are not twisted together. It is, however, also possible to employ multifilament cores comprising twisted fibres, two fibre strands preferably being twisted together.

The plastics employed for the coating consists of a plastics material resistant to hydrolysis, e.g. of polyurethane, or polyvinylidenefluoride, or polyvinylfluoride, or polytetrafluoroethylene - perfluoropropylene, or polyamide, or a modified polyolefin or polycarbonate, or a polyimide, or polybutylene, or acrylonitrile. Threads so coated are appropriate for sieves or screens for paper-making machines in which the threads may be exposed to chemical attack whilst in service.

If the wear-resistance of the thread is of prime importance, the plastics material employed for the coating will be resistant to mechanical stresses, e.g. such as polyurethane, or polyvinylidenefluoride, or polyvinylfluoride, or polytetrafluoroethylene - perfluoropropylene, or polyamide, or a modified polyolefin or polycarbonate or a polyimide. Threads so coated possess a high resistance against mechanical stresses, such as frictional wear and impact stresses.

In the embodiment illustrated in Figs. 1 and 2, the core 1 consists of a multiplicity of single fibres 3 which are very thin, e.g. the fibres have a diameter of approximately 0.02 mm. For a core diameter d, for example amounting to 0.42 mm, the core 1 may consist of approximately 200 individual fibres 3. The fibres preferably consist of polyester, rayon or glass.

For a core diameter d of 0.42 mm, the coating 2, which is preferably applied by an extrusion process, may have a thickness t of approximately 0.1 mm, so that the overall diameter D of the coated thread amounts to

0.62 mm. Different plastics, examples of which are given above, may be employed as materials for the coating 2. Other plastics, which are still in process of development, may however also be employed as coatings.

Different methods may be employed for applying the coating to the core. Preferably the coating is effected by an extrusion process in which the core is moved through an annular nozzle from which a molten synthetic plastics coating material emerges. The coating may however also be effected by melting the coating material by heat, the core being drawn through the melt. Both processes avoid the use of solvents in the synthetic material.

In Fig. 2, the coating 2 has been removed from the right-hand portion of the illustration, so that the fibres of the core 1 are shown. In the thread illustrated, the core consists of fibres which are not twisted together.

If colourless or white fibres are employed for the core 1, it is possible to use optional colours for the coating 2, which may be of advantage.

The sieve or screen illustrated in Fig. 3 consists of warp threads 4 and weft threads 5. The warp threads and weft threads are worked together in a plain weave, i.e. the weft threads 5 alternately cross over and under the warp threads 4 and the warp threads 4 alternately cross under and over the weft threads 5. An interstice *a* is present in each case between the warp threads 4, and an interstice *b* is present in each case between the weft threads 5. These interstices are of equal size in the fabric illustrated, but may evidently also be different. As apparent from Fig. 3, the interstices form rectangular, for example square, passages 6 between the threads. The points of intersection 7 of the warp threads 4 and weft threads 5 are welded together, that is to say by fusing their coatings 2.

The threads 4 and 5 may be pressed flat, after the weaving operation, by exerting a pressure on the fabric, e.g. by means of rollers. This pressure may be so chosen that the threads are flattened only in the areas of their points of intersection. It may however be chosen to be so powerful that the threads undergo flattening at all points. It will be understood that a sufficiently powerful flattening action will reduce the size of the interstices 6. It is possible in this way to determine the permeability of the sieve or screen in simple manner.

The warp threads 4 and the weft threads 5 may have a coating 2 of coloured plastics, threads of different colours also being usable for a fabric, so that optional patterns may be produced which facilitate the identification of the fabrics or of individual threads.

WHAT WE CLAIM IS:—

1. A paper-making machine comprising a sieve or screen made by the method which includes the steps of producing non-porous warp and weft threads by coating core threads with a molten thermoplastics material, and so weaving the warp and weft threads as to leave interstices between them.

2. A paper-making machine comprising a sieve or screen made by the method according to Claim 1, in which the threads are woven in a manner such that the weft threads alternately cross over and under warp threads and the warp threads alternately cross over and under the weft threads.

3. A paper-making machine comprising a sieve or screen made by the method according to Claim 1 or Claim 2, and in which the method includes the step of welding the points of intersection of the warp and weft threads by fusing their coatings.

4. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 3, and in which the method includes the step of pressing the threads flat at least at the points of intersection thereof.

5. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 4 in which each coated core thread has a multifilament core.

6. A paper-making machine comprising a sieve or screen made by a method according to Claim 5, wherein the weight of the core lies within the range from 0.1 to 2.5 kgs/10,000 m (1,000 to 2,500 dtex) and that the thickness of the coating is between 0.03 and 0.3 mm.

7. A paper-making machine comprising a sieve or screen made by the method according to Claim 6, wherein the core has a weight of 1.1 kg/10,000 m (1,100 dtex) and the coating has a thickness of 0.1 mm.

8. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 5 to 7, wherein the core consists of fibres which are not twisted together.

9. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 5 to 7, wherein the core consists of fibres twisted together.

10. A paper-making machine comprising a sieve or screen made by the method according to Claim 9, wherein the core consists of two fibre strands twisted together.

11. A paper-making machine comprising a sieve or screen made by the method according to Claim 1 in which the core thread is a monofilament of synthetic material.

12. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 11, wherein the coating consists of a plastics material resistant to hydrolysis and/or mechanical stresses and chosen from the group comprising polyurethane, polyvinylidenefluoride, poly-

vinylfluoride, polytetrafluoroethylene - perfluoropropylene, polyamide, a modified polyolefin or polycarbonate, and a polyimide.

13. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 11, wherein the coating consists of a plastics material resistant to hydrolysis and chosen from the group comprising polybutylene and acrylonitrile.

14. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 13, characterised in that the coating consists of pigmented plastics material.

15. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 14, characterised in that the coating is effected by an extrusion process in which the core thread is moved through an annular nozzle from which molten synthetic thermoplastics material is extruded around the core thread.

16. A paper-making machine comprising a sieve or screen made by the method according to any one of Claims 1 to 14, characterised in that a coating is applied by a hot-melt process, the core thread being drawn through a hot-melt of synthetic thermoplastics material.

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Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1972.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1290781 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

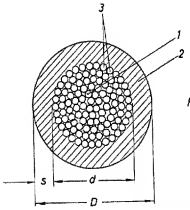

Fig. 1

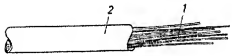

Fig. 2

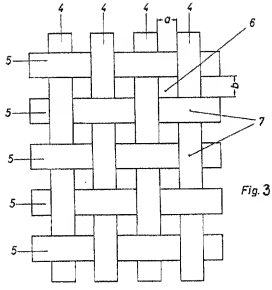

Fig. 3